ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5.] [1908.

XXVII.—ECANDA RUBBER.

(*Raphionacme utilis*, Brown & Stapf).

OTTO STAPF.

In 1906, Mr. C. E. de Mello Geraldes, Professor in the Instituto de Agronomia e Veterinaria at Lisbon, published in his "*Estudo sobre os latex borrachiferos*," pp. 143–172, an article dealing with a new rubber plant known in Benguela as 'Ecanda' or 'Marianga.' But it was only in the summer of the following year that the discovery became more generally known through a short abstract from Prof. Geraldes' paper published in *The India Rubber World* (vol. xxxvi., p. 300). About the same time, in July of last year, a portion of a tuber was submitted to Kew for identification by Mr. Spencer Brett on behalf of Messrs. Gow, Wilson & Stanton, Ltd. It was stated to yield good rubber, and to have been sent "from the neighbourhood of Lake Nyasa." The tuber was made out to belong most likely to the Asclepiadaceous genus *Raphionacme*. Later on in the year Kew received from the Companhia de Moçambique a number of healthy specimens of 'Bitinga Tubers' or "Tubers of the plant from which the 'Bitinga' Rubber is extracted." They were evidently identical with the tuber communicated by Mr. Brett and stated to have come from West Africa. The tubers have been grown in the Royal Gardens and one of them flowered early in March of the present year. Although it is proposed to figure and describe the plant in the Botanical Magazine, it seems desirable in this place to give a preliminary description and a general account of the plant and its properties.

The 'Bitinga' plant agrees very well with the description and figures given by Prof. Geraldes, of the 'Ecanda' plant, and there is practically no doubt that they are identical. It is a new species of *Raphionacme*, nearly allied to *R. Welwitschii*, Schlechter & Rendle, a native of Central Angola, and is described below as *Raphionacme utilis*, Brown & Stapf. It differs from all the rubber

1375 Wt 35 6/08 D & S 29 32336

plants already known in so far as it is a dwarf herbaceous plant with a fairly large subterrestrial tuber abounding in caoutchouc. As practically all our knowledge concerning the distribution, properties of the plant, and the process of working it, is at present confined to what we may learn from Prof. Geraldes' article, a translation of the more important paragraphs is given here.

"The interest attaching to the 'Ecanda' or 'Marianga' rests not only on the fact that we have to deal here with a new species and moreover one which is morphologically different from all the other known rubber plants, but also, and more especially, as I believe, on its capacity of producing first-class rubber and the facility of working it, in which respect it has no rival.

"The 'Ecanda' is a herbaceous, stemless plant with a tuber-shaped root fairly large and rich in latex.

"From experiments made in the interior of Benguela in order to find out the best process for the preparation of Ecanda rubber, I came to the conclusion that the only rational and practical method is by crushing the roots and treating the latex thus obtained by one of the processes of 'lato-borrachificaçao externa' (coagulation of the latex after extraction). It is evident that the method of first extracting the latex very much simplifies the preparation of rubber and clearly results in considerable economy. The 'Ecanda' or 'Marianga'* is found in the treeless, sandy and alluvial tracts (anhâras) of Bailundo and Bihé and the Xânes (sandy and treeless tracts) of the region between the rivers Kwanza and Zambese (Ganguellas), the home of the Otarampa (*Carpodinus chylorrhiza*).† Those tracts occur locally, as a rule near the headwaters and along the banks of the rivers, occupying, sometimes, vast areas, and it is in their drier parts that the 'Ecanda' thrives. The altitude of the region where the 'Ecanda' grows is from 4,000 ft. (Ganguellas) to 5,500 ft. (Bihe).

"As stated, the laticiferous tubes of the 'Ecanda' are found spread all over the pulp of the root; at the same time the latex, being very concentrated, coagulates rapidly in contact with air. It is therefore not possible to extract it entirely from the roots by means of incisions.

"The extraction of the rubber direct from the roots necessitating, as it does, first prolonged boiling and then crushing, followed by repeated washing is not practical since, apart from the tediousness of the process, it implies necessarily the use of chemical agents in order to secure the complete separation of the caoutchouc from the pulp by the disorganisation of its tissues. And even so, unless dissolvents are used for the purification, the rubber remains somewhat impure as may be well imagined.

---

* 'Ecanda' is the name by which the species (which occurs in Bailundo and Bihe) is known to the Bailundes and Bihanos, and it is, I assume, identical with the species known to the Lutxases (Ganguellas) as 'Marianga.'

† I suppose that the 'Ecanda' also occurs in the Xana of Xifumage (an affluent of the Zambese which I have crossed), a vast, treeless, sand and humus plain to the north-east of the district of Benguela. But when I traversed it, the natives had set fire to it as they are used to do, and the whole vegetation was destroyed.

"But to my great satisfaction I made sure that it was possible to extract the latex of the 'Ecanda' (although mixed with the sap of the roots) with great ease by means of simply crushing the roots. To extract the latex proceed as follows:—After having washed the roots well, cut them into several pieces at a right angle to their greatest diameter and subject them to a slight pressure in a copying press. When the liquid ceases to flow raise the top of the press, turn the pulp and subject it anew to slight pressure. Repeat these operations as long as the liquid comes out yellowish and without streaks of white, that is to the point when the latex is completely extracted and only root sap continues to flow.

"To obtain this result it is necessary to extract from the roots, on the average, 77·7 per cent. (of the weight) of the liquor; hence the latex is much diluted (1·5 per cent. of the liquid extracted from the roots should on the average be pure latex). Having found a practical process for extracting the latex, I tried now to determine the best method for coagulation.

"I obtained good coagulation with alcohol or brandy whenever the latex was not very much diluted. This process is evidently not economical as the coagulating agents are dear. . . .

"Acetic acid, sulphate of aluminium and potassium, phenol and chlorate of sodium do not act on the latex diluted with root sap. . . . Other coagulating agents I was not able to try. . . . It is, however, probable that coagulation of the latex of 'Ecanda' may be obtained with other agents, even when it is diluted with root sap.

"The process of skimming leaves much to be desired, since, in my experiments, I have never succeeded in extracting by this method more than half of the caoutchouc contained in the latex . . .

"I also studied the effect of heat on the liquid obtained by pressing the roots of the 'Ecanda.'

"If the liquid is subjected direct to the action of fire, a skin forms on the surface, like that on boiled milk, consisting of caoutchouc. If this skin is removed in the measure as it forms, its production ceases after some time, and when at length the liquid is completely evaporated, a copious yellow and viscous residue is left.

"By substituting a hot bath for direct fire and proceeding in the manner just described, there also remains a yellow and viscous residue, but it is less copious. In this way I obtained a greater percentage of caoutchouc which was of greater elasticity than that produced by coagulating direct over fire.

"Thus by using heat as the coagulating agent I always obtained beside the caoutchouc a more or less copious residue of a yellow and viscous substance. Now, it is well known, that generally caoutchouc, if subjected to temperatures above 35° C., gradually loses its elasticity, and turns viscous, until at 170° to 180°C. it is converted into a thick liquid much resembling molasses. Therefore, it might be supposed that the residue mentioned above also consisted principally of resinified caoutchouc.

"My suspicion was confirmed when treating the latex by a mixed process of skimming and spontaneous desiccation.*

"By this method I obtained a much higher percentage of rubber and only a small residue, consisting likewise of a yellow and viscous matter. However, the rubber was less elastic than that obtained by coagulation in the hot bath. This is not surprising, seeing that the rubber prepared by the latter process contains all the components of the latex and the root sap (excepting the greater part of the water), and, besides, I had not been able to strain the liquid, having no metal net nor adequate strainer with me.

Processes employed.	Percentage of raw rubber per cent.		Loss by drying per cent.
	Green.	Dry.	
Coagulation over fire	2·90	1·870	35·50
„ in the hot bath	3·54	2·415	33·09
Skimming and spontaneous desiccation	13·00	6·360	51·60

"In order to determine the percentage of pure caoutchouc obtained by these processes, I analysed the samples of 'Ecanda' rubber prepared in Benguela, in the chemical laboratory of the Instituto de Agronomia e Veterinaria, with the following results :—

RUBBER OBTAINED BY COAGULATION IN THE HOT BATH.

Caoutchouc	88·025 per cent.
Resins	4·725 „
Substances soluble in water	1·100 „
„ „ in alcohol at boiling point	1·300 „
Water	1·082 „
Impurities not determined	3·768 „

RUBBER OBTAINED BY SKIMMING AND SPONTANEOUS DESICCATION.

Caoutchouc	71·925 per cent.
Resins	3·300 „
Substances soluble in water	2·950 „
„ „ in alcohol at boiling point	1·385 „
Water	3·154 „
Impurities not determined	16·926 „

* To extract the rubber by this method I proceeded as follows :—I poured the liquid obtained by the crushing of the 'Ecanda' roots into enamelled iron dishes so as to form a layer 1 cm. thick. After a while in every one of the dishes and adhering to their sides a skin of rubber formed on the surface of the liquid. This skin I removed, and so I went on for two days—the duration of the experiment—new skins continuing to form, but every time less thick. Then the production of skins ceased. But to make sure whether the liquid still contained caoutchouc I left it in the dishes until the evaporation was complete, which was the case five days after the commencement of the experiment. As the dishes were exposed to the air, and the latex somewhat caught the sun, I believe that the little yellow and viscous residue which formed consisted to a small extent of resinified rubber.

"Thus I obtained by coagulation in the hot bath 2·125 per cent. of chemically pure caoutchouc, calculated from the weight of the fresh root, and by the mixed method of skimming and spontaneous desiccation 4·574 per cent. of pure caoutchouc ; that is, I obtained by the latter process more than twice the quantity of pure caoutchouc than by the first.

"It follows, therefore, that, of the processes which I tried, it was the process of skimming and spontaneous desiccation by which I obtained the best result. The great drawbacks inherent in that method are, however, aggravated when it is applied to the treatment of a liquid resulting from the crushing of the Ecanda root, and that makes it hardly practicable.

"Indeed, as in this case a much diluted latex has to be dealt with, its coagulation (1) requires, *ipso facto*, much time ; (2) implies the use of a great number of recipient vessels ; and (3) necessitates a very spacious installation. Moreover, as the latex is not pure, but a mixture of latex and sap, (4) the rubber turns out very impure, the normal constituents of the latex being precipitated together with the substances which were dissolved in the sap of the 'Ecanda' root.

"No doubt points 1–3 could be improved upon by using for skimming and evaporating very porous earthen pans and keeping the liquid at a relatively high temperature ; but the disadvantage mentioned under (4) is fundamental . . . Possibly better results will be obtained with chemical coagulents with or without the aid of heating . . . But in my opinion the really practical method of preparing the 'Ecanda' rubber should consist in the centrifugalisation of the liquid obtained by the crushing of the roots. As there was no centrifugal machinery in Benguela I was, to my great regret, unable to try that process."

It would appear that Mr. Geraldes' experiments with 'Ecanda' rubber stimulated some Bihanos (inhabitants of Bihé) to prepare 'Ecanda' rubber themselves, and some of it was actually on the market. Prof. Geraldes describes two of their methods and gives analyses of a sample obtained by one of them :—

"The first method is as follows : They cut the roots into slices, and then expose them on the soil to the action of the sun. In this way the exuding latex is converted into rubber by desiccation and partly also by absorption of its serum through the soil. They thus obtain pieces of a mixture of rubber and soil out of which small cylinders (mutáres) about 12 cm. by 1·5 cm. are made, or small balls which they join in clusters of 4 or 5, and those clusters are also called mutáres (as it were fingers). The mutáres produced in this way have as a rule a good external appearance, but within they contain a great deal of earth which, apart from greatly depreciating the quality of the rubber, has the inconvenience of making them excessively heavy.

"I analysed several samples of mutáres prepared by this method which I brought from Benguela to the Institute.

	Average Composition per cent.
Caoutchouc	45·81
Resins	1·50
Substances soluble in boiling alcohol ...	1·27
Substances soluble in water and impurities ...	51·42

"Samples from the same origin, but previously dissolved in carbon bisulphide and filtered through a cotton filter, gave the following result :—

	Average Composition per cent.
Caoutchouc	92·640
Resin	3·570
Substances soluble in alcohol at boiling point	2·825
Substances soluble in water	0·965

"The other method is still worse. It is as follows : the roots are boiled and then pounded in a mortar. The mass thus obtained is washed out with cold water to eliminate the pulp, and then put in boiling water in order to become workable. Of this mass (which, of course, is still contaminated with a great percentage of pounded vegetable matter) they make mutáres analogous to those described above.

"This process is—as may well be imagined—much worse than the other, considering that the rubber remains contaminated with a great deal of organic matter which easily sets up fermentation and deteriorates the rubber."

Prof. Geraldes also touches the very important point of the rate of growth of the 'Ecanda' tubers. On p. 148 he describes the plants as "biennial (?)," and adds in a foot-note : "one-year old roots which I examined (in the fruiting state) had a diameter of 8-10 cm. (about 3–4 in.), and weighed 200–300 grammes (7–10½ oz.) ; the larger tubers which I saw and which were at least two years old measured 12–14 cm. (4¾–5½ in.) across and weighed 400–600 grammes" (14–21 oz.). There is no evidence that Prof. Geraldes raised plants from seed, for he would no doubt have mentioned the fact had he done so, and his estimate of the age of the tubers measured and weighed rests, apparently, entirely on assumption. *A priori* it appears very improbable that the 'Ecanda' plant should flower in the first year of its growth, or that its tubers should attain the dimensions given above in so short a time. In any case this point demands close examination, as the productiveness of an 'Ecanda' plantation would to a great extent depend on the rate of growth. Prof. Geraldes' calculations of the yield of 'Ecanda' plantations have therefore to be taken *cum grano salis*, and appear in any case far too optimistic. This is what he says on p. 168 :—

"1. If roots one year old are worked, one hectare (nearly 2½ acres) might yield 111,111 'Ecanda' plants, weighing 27,778 kilos (about 27 tons), and producing 125 kilos (nearly 2½ cwt.) of caoutchouc (chemically pure and dry), or a gross return of 312 dols. 500 reis per annum.

"2. If only two year roots are worked, a hectare might yield 83,333 'Ecandas,' weighing 41,666 kilos (about 41 tons), and producing about 200 kilos of caoutchouc (chemically pure and dry), or a gross return of 520 dols. 830 reis per annum."

At present there are about 20 species of *Raphionacme* known, nearly all of them natives of Tropical Africa south of the equator.

Digitized by the Internet Archive
in 2025

https://archive.org/details/kew-bulletin_1908_5

Raphionacme utilis, *Brown and Stapf.*

To face page 215.

They are all small herbs, from a few centimetres to one metre high, and in many cases are known to possess a tuberous rootstock like that of the 'Ecanda' plant. Five species are recorded from Portuguese West Africa, whilst four occur in Nyasaland, and one each in Bechuanaland (and Rhodesia), the Bahr-el-Ghazal, and in Sierra Leone.

Description.

Raphionacme utilis, *Brown et Stapf*; affinis *R. Welwitschii*, Schlecht. et Rendle, sed planta nana foliis latioribus approximatis rosulatis, corona subbiseriata, *i.e.*, lobis lateralibus contiguis per paria in squamam bifidam connatis et lobum intermedium extus leviter imbricantibus.

A perennial herb with a turnip-shaped tuber, up to 4 in. high and 2–5½ in. in diameter, with a dark brown, scaly bark. Stems solitary, erect, herbaceous, 1–4 in. long, fulvo-puberulous. Leaves in 2–5 pairs, forming in the wild state, according to Geraldes, a rosette close to the ground, spreading, broad-ovate or elliptic to suborbicular, obtuse, apiculate, 1½–2 in. long, 1¼–1¾ in. broad, rounded to subcordate at the base, sparingly puberulous on both sides, green above, bright purple below; petiole ½–⅔ in. long. Flowers in terminal and axillary, sessile, crowded, fulvo-pubescent cymes; pedicels up to ¼ in. long; bracts linear, up to ⅙ in. long. Sepals lanceolate, acute, 1½ lin. long, puberulous, purplish with green tips. Corolla bright purple, about ½ in. in diameter, very deeply 5-fid, lobes very minutely puberulous on the back, glabrous on the face; lobes oblong, subacute with recurved margins. Corona subbiseriate; outer (epipetalous) corona of 5 bifid scales, 1 line long, white with bright purple-tipped teeth, inner (episepalous) corona of 5 subulate, acute lobes, ⅙ in. long, the sides covered at the base by the outer scales, dark purple, much exceeding the stamens. Follicles (Geraldes) broad spindle-shaped, acuminate, up to 4 in. long. Seeds about 50 in each follicle, about 4 mm. long with a coma, 15 mm. long.

EXPLANATION OF THE PLATE.

1. A large tuber, 5½ inches in diameter, with leafy shoots, growing in the Royal Gardens, about half natural size.
2. The 'Ecanda' tuber as imported. Half natural size.
3. An inflorescence produced in the Royal Gardens. Natural size.
4. A single flower. × 3.
5. The details of the corona of the flower. × 6.

Figures 1 and 2 from photographs, 3–5 from photographs of drawings by Miss M. Smith. All the photographs by Mr. C. P. Raffill.

XXVIII.—FUNGI EXOTICI: VIII.

G. Massee.

Of the twelve new fungi here described from material in the Herbarium at Kew, nine have been sent from various tropical colonies, two are from Cape Colony and one from N. W. India.

Agaricaceae.

Volvaria esculenta, *Massee.*

Pileus carnosulus, campanulatus margine striatulo, siccus, levis, griseo-lividus disco obscuriore, glaber, 6 cm. latus. *Lamellae* postice liberae, ventricosae, confertae, albido-carneae, acie albo-fimbriata. *Sporae* ellipsoideae, glabrae, carneae, 6–7 × 4 — 5μ. *Stipes* centralis, subcavus, aequalis, glaber, 5–6 cm. longus, 5 mm. crassus, albidus; volva libera, ampla limbo lobato, pileo concolor.

Tropical Africa. Old Calabar; growing on coffee pulp, *Holland*, 24.

Grows abundantly on heaps of coffee pulp, and is eaten by both natives and Europeans. Allied to *Volvaria volvacea*, Bull., which differs in having adpressed blackish fibrils on the pileus and a solid stem.

Polyporaceae.

Boletus curtipes, *Massee.*

Pileus pulvinato-expansus, sordide brunneus, tomentosus, in aetate profunde reticulato-rimosus margine acuto primum flocculoso, 8–10 cm. diam. *Tubuli* elongati, circa stipitem abbreviati, poris polygonis amplis griseo-luteis. *Stipes* crassus, brevis deorsum incrassatus pileo concolor, sursum subtiliter reticulatus, exannulatus. *Sporae* fusoideae, olivaceo-tinctae, 13–14 × 3·5–4·5 μ.

South Africa. Cape Colony; on the ground, *W. F. Saxton.*

Obviously allied to *Boletus pachypus*, Fr., and *B. edulis*, Fr., and will probably prove to be edible. The first record of the occurrence of the genus *Boletus* in Africa, since *Boletus concretus*, Dur. et Lév., previously recorded from Algeria, proves to belong to the genus *Polyporus.*

Hexagonia Bartlettii, *Massee.*

Pileus repenti-effusus, irregulariter expansus, saepe lobatus margine determinato, non libero, rigidus, tenuiusculus, circa 1 mm. crassus, sordide aurantiacus. *Alveoli* brevissimi, 0·5 mm. prof., ore majusculo, 0·5 mm. diam., penta-hexagono, sat regulari, dissepimentis tenuibus acie acutiuscula, sub lente fimbriatis. *Sporae* ellipticae, hyalinae, 5 × 3 μ.

British Guiana. Georgetown; on dead, fallen branches, Botanic Garden, *A. W. Bartlett*, 8701.

Superficially resembling a species of *Poria*, but distinguished by the large polygonal, shallow pores of the hymenium. Thin, quite inseparable from the matrix, often extending for several

inches in length. Most nearly allied to the resupinate form of *Hexagonia sericea*, Fries, from which the present species differs in the dull orange colour of the hymenium, and the larger and more regular pores.

Daedalea Gollanii, *Massee*.

Pilei orbiculari-dimidiati, coriaceo-rigidi, postice adnato-decurrentes, densissime aggregato-imbricati, 1·5–2 cm. diam. transv. et ant.-post., superne concentrice 3–5-zonati, glabri, ochraceo-carneoli, margine tenui, striatuli. *Hymenium* e poroso lamellosum, lamellulis lacerato-dentatis; postice 5–6 mm. longis, ochraceis. *Sporae* nondum obviae.

INDIA, N.W.P. Mussoorie; on dead wood, Chajuri Garden, 5,600 feet, *Gollan*, 3.

A distinct and interesting species allied to *D. unicolor*, Fries. The numerous closely imbricated pilei form a mass about nine inches long by five inches broad. Very rigid when dry.

LYCOPERDACEAE.

Lycoperdon lignicolum, *Massee*.

Peridia pusilla, sessilia, globulosa, furfuracea, pallida vel straminea, 3–4 mm. lata, subiculo albido effuso enata. *Gleba* gossypina ochraceo-albescens, floccis gracilibus hyalinis, levibus. *Sporae* globosae, hyalinae, scabrae, 3·5–4 μ diam.

SELANGOR. Kuala Lumpur; on dead bark, *Ridley*, 166.

The minute peridia are gregarious on a compact, broadly effused, whitish stroma, in which respect the plant differs widely from all previously described species. *Geaster subiculosus*, Cooke and Massee, resembles the present species in habit and appearance, and might even be mistaken for it before the rupture of the peridium.

EXOBASIDIACEAE.

Exobasidium Fawcettii, *Massee*.

Foliicolum; folia infecta hypertrophica, crassiora, tortuosa, atque saepius bulbosa, violaceo-rubra vel rosea, demum albo-farinulosa. *Basidia* cylindracea, apice obtuse rotundata, 3–4 sterigmatophora, 55–60 × 7–8 μ. *Sporae* fusoideae vel sigmoideae, hyalinae, continuae, 15–16 × 4–4·5 μ.

WEST INDIES. Jamaica; on living leaves of *Lyonia jamaicensis*, D. Don, *W. Fawcett*.

Allied to *Exobasidium rhododendri*, Cramer, but readily distinguished by the much larger spindle-shaped spores.

UREDINACEAE.

Uredo satyrii, *Massee*. *Maculae* nullae vel vix manifestae. *Acervuli* epiphylli, rarius amphigeni, numerosissimi, gregarii, sordide pallideque ferruginei, epidermide diu velata. *Sporae* globosae vel ovatae, episporio pro ratione tenui undique dense minuteque verruculoso, subhyalinae, 24–27 μ, vel 25–30 × 16–18 μ.

South Africa. Cape Colony; on living leaves of *Satyrium coriifolium*, Swz., "destroying cultivated specimens," *McOwan*.

Differs from *Uredo orchidis*, Wint., in the spore-clusters not being arranged in irregular concentric rings, and in the colourless spores.

Sphaeriaceae.

Nectria theobromae, *Massee*.

Perithecia gregaria vel sparsa, superficialia, ovata, levia, glabra, aurantiaco-rubescentia, ostiolo minuto vix prominulo hiante, 0·5 mm., alt. *Asci* cylindracei, stipitati, octospori, paraphyses septatae, ascos excedentes, hyalini, apice vix incrassato, interdum flexuoso, 3μ crasso. *Sporae* oblique monostichae, hyalinae, ellipsoideae, 1-septatae, ad septum subconstrictae, 28–30 × 8–10 μ.

West Indies. Grenada; "on a 'bleeding' patch of bark of a cacao tree," *Howard*.

This appears to be one of the various species of parasitic fungi that form "bleeding" wounds in the bark of the cacao tree. *Nectria Bainii*, Mass., previously described as forming similar wounds on cacao pods, differs from the present species in having the perithecia shaggy with golden-yellow scale-like hairs.

Phyllachora Dawei, *Massee*.

Stromata epiphylla, superficialia, effuso-crustacea, bullata, atra, rugulosa, 4–7 mm. diam., subglobosa, laxe aggregata vel confluentia, dense loculifera, contextu indistincto. *Loculi* saepe confluentes, difformes. *Asci* cylindracei, apice rotundato, deorsum attenuati, pedicellati, 80–100 × 11–12 μ, octospori, dense paraphysati. *Sporae* obliquae, monostichae, hyalinae, ellipsoideae, utrinque rotundatae, continuae, 21–23 × 9–10 μ.

Tropical Africa. Buddu, Uganda, 4000 ft.; on living leaves of *Ficus*, sp., native name "Kokanwe," *Dawe*, 290.

Allied to *Phyllachora repens*, Sacc., differing in the larger, irregularly scattered (not seriate) stromata, which resemble drops of pitch sprinkled over the leaf, and the larger spores.

Dermatea mycophaga, *Massee*.

Ascomata subsessilia, carnosa, aggregata, mox applanata, disco ferrugineo extus glabrato obscuro, 0·5 mm. diam. *Sporae* oblique monostichae, ellipsoideae, hyalinae, glabrae, eguttulatae, 5 × 3 μ. *Paraphyses* filiformes, sursum ramosae, brunneae.

Straits Settlements. Growing on the stroma of an old *Xylaria*, *Ridley*, 158.

Densely gregarious; remarkable for the peculiar habitat.

Hyphomycetaceae.

Graphium anomalum, *Massee*.

Stroma verticale, flavidum, siccitate rigidum, 1·5–2 mm. altum, e fibris conglutinatis compositum, hyphis sursum relaxatis pallidioribus conidiiferis. *Conidia*, continua, hyalina, ellipsoidea, 5 × 1·5 μ, conidiophoris lateralibus enata.

Gold Coast. Aburi ; on dead herbaceous stem, *Johnson*, 112.

Stromata fasciculate, departing from the type structure of *Graphium* in having the conidia borne on lateral conidiophores.

Gloeosporium pestis, *Massee.*

Maculae epiphyllae, rarius amphigenae, congestae, nigro-brunneae. *Acervuli* quoque amphigeni, dense gregarii, sub epidermide foliorum nidulantes, pulvinati, demum erumpentes, 150 μ diam. *Conidia* ovato-oblonga, continua, hyalina, basi oblique apiculata, 18–20 × 5 μ.

Fiji. On living Yam leaves, *C. H. Knowles.*

According to the following account, which accompanied the specimens, this parasite threatens to become a serious pest unless promptly arrested. "It is found that not all varieties are attacked ; the ones sent are from the variety which seems most liable to attack. The present season has been an extremely wet one. I have come across it before, but this year it appears to have been much more severe. Last year (the driest on record for 22 years) only very few leaves were seen to be affected."

The entire upper surface of the leaf is often covered with blackish blotches resembling *Gloeosporium musae*, Mass., in habit and general appearance, but differing in the smaller spores.

XXIX.—DIAGNOSES AFRICANAE: XXII.

920. Heliophila sulcata, *Conrath* [Cruciferae] ; affinis *H. suavissimae*, Burch., sed caulibus e collo pluricipite pluribus haud vel parce ramosis, foliis plerisque basi congestis longioribus.

Herba perennis, caules 30–40 cm. altos simplices vel subsimplices sulcatos e collo pluricipite emittens, glabra. *Folia* anguste linearia, breviter acuta, pleraque basi congesta, 6–15 cm. longa, 0·5–1 mm. lata, caulina 1–2 breviora. *Racemus* laxus, ad 15 cm. longus ; pedicelli subanthesi erecti, deinde patuli vel penduli, 10–15 mm. longi. *Sepala* anguste oblonga, obtusa, albo-marginata, 4 mm. longa. *Petala* elliptico-oblonga, basi cuneata, 8 mm. longa, purpureo-rosea. *Siliquae* late lineares, marginibus leviter undulatis, utrinque breviter acutatae, 4–5 cm. longae, 3 mm. latae, valvis uninerviis venis delicatis longitudinalibus, stylo 3–4 mm. longo coronatae, pendulae. *Semina* 8–12, 2–2·5 mm. diametro.

Transvaal. Near Johannesburg, *Conrath.* (The same plant was collected by Dr. Bolus in Bester's Vlei, near Harrismith, Orange River Colony, at 5,400 ft., No. 8120.—Otto Stapf.)

921. Heliophila Woodii, *Conrath* [Cruciferae] ; affinis *H. divaricatae*, Banks ex DC., sed ramis nullis vel e basi erectis, foliis multo longioribus, floribus roseis duplo majoribus.

Herba annua, glabra, 30–40 cm. alta. *Caulis* erectus, simplex vel basi ramosus, ramis erectis superne angulatis ad vel ultra medium foliatis. *Folia* internodiis longiora, numerosa, linearia, plerumque longe in basin attenuata, 1·5–5 cm. longa, 1–2 mm. lata, accutiuscula.

Racemus laxus, tandem 7–12 cm. longus ; pedicelli 4–10 mm. longi, primo erecti, demum patule recurvi. *Sepala* oblonga, obtusa, 3·5–4 mm. longa, 1–1·5 mm. lata. *Petala* oblongo-elliptica, basi cuneata, roseo-purpurea, 6 mm. longa, 1·5 mm. lata. *Siliquae* anguste lineares, rectae vel subrectae, utrinque breviter attenuatae, pendulae vel patulae, 3·2–4·6 cm. longae, 7·5 mm. latae, valvis uninerviis venis longitudinalibus delicatis nonnullis. *Semina* 15–20, 1·5 mm. longa.

NATAL. In meadows near Durban, *Conrath*, No. 736. [The same species is represented at Kew by the following specimens :— Natal, in grassy places near Durban, Wood, 146 ; Grant, I. ; J. Sanderson, 382 ; "Eastern Province," Bowker, n. 213.—Otto Stapf.)

922. **Polanisia tripyhlla,** *Conrath* [Capparidaceae] ; affinis *P. maculata*, Sond., sed differt floribus minoribus, staminibus 6, quorum 4 sterilia filamentis superne sigmatice curvatis, 2 fertilia filamentis rectis.

Herba annua, ad 30 cm. alta, glaberrima, caule erecto supra basin ramis nonnullis virgatis aucto sulcato. *Folia* approximata, petiolata, trifoliolata ; foliola subfiliformia, margine asperula, 8–24 mm. longa, 0·5–0·75 mm. lata ; petiolus 4–14 mm. longus ; folia summa reducta, saepe simplicia. *Racemi* laxi, elongati ; pedicelli tandem ad 8 mm. longi. *Sepala* lanceolata, tenuiter acuminata, 2·5–3 mm. longa. *Petala* 2 longiora oblonga, cuneatim unguiculata, 4–5 mm. longa, rosea, 2 breviora abrupte unguiculata, saturatius rosea, supra unguem utrinque macula citrina ornata. *Stamina* 6 ; 4 petala aequantia, sterilia, filamentis superne sigmatice curvatis et apice incrassatis, caetera paulo longiora, fertilia, filamentis rectis apice haud incrassatis. *Capsula* pendula, linearis, utrinque sensim attenuata, 32–55 mm. longa, 2 mm. lata, nervoso-striata. *Semina* transverse argute-rugosa.

TRANSVAAL. Near Pretoria, *Conrath*, 11.

923. **Pavonia commutata,** *Conrath* [Malvaceae] ; affinis *P. clathratae*, Mast., sed floribus minoribus, epicalyce calyceque brevioribus, carpellis multo minoribus dorso angustis induratis minime alatis distincta.

Herba perennis, basi lignescens. *Caulis* erectus, ramosus, teres uti petioli pedicellique pilis brevibus eglandulosis vel glanduligeris pubescens, praeterea imprimis inferne pilis patulis tenuibus conspersus. *Folia* ambitu cordato-ovata, profunde 5-vel superiora 3-fida, segmento intermedio longiore uti caeteris utrinque 4–2-dentato, 2–4 cm. longa, 3–5 cm. lata, utrinque praecipue in nervis pilosa, subtus pilis nonnullis stellatis additis ; petiolus 3–1 cm. longus ; stipulae filiformes. *Pedicelli* solitarii, petiolum aequantes vel paulo superantes, apice articulati. *Epicalycis* phylla 10–12, subulata, circiter 15 mm. longa, pubescentia pilis glanduligeris intermixtis, longe setoso-ciliata. *Calyx* 5-fidus, segmentis triangulari-ovatis acutis, pubescens, submembranaceus, circa 7 mm. altus. *Petala* epicalycem aequantia, lutescentia, rubro-suffusa. *Carpella* matura 5, 6–7 mm. longa, acute marginata. *Semina* brunnea, 4 mm. longa, subacuta ; testa tennuissime punctato-striata.

TRANSVAAL. On hills near Pretoria, *Conrath*, 42.

[To this species are also referable the following specimens in the Kew collection :—Pretoria, J. W. C. Kirk ; Boshveld, Elands river, Rehmann, 4938 ; stony and grassy hills near Potgieters Rust (Pietersburg Distr.), 1140 m., Bolus, 11024.—Otto Stapf.]

924. **Gymnosporia vacciniifolia,** *Conrath* [Celastraceae] ; affinis *G. saxatili*, Conrath (*Celastrus saxatilis*, Burch.) floribus fructibusque multo minoribus distincta.

Frutex divaricatus, ad 1·5 m. altus, ramis teretibus cinereo-fuscis saepe curvatis spinis rectis armatis, ramulis valde abbreviatis. *Folia* in brachycladiis fasciculata, oblonga vel obovato-oblonga, basi cuneata, apice rotundata vel subemarginata, 5–12 mm. longa, 2–3·5 mm. lata, utrinque prominule nervosa, coriacea, glabra, obscure viridia ; petiolus vix ullus. *Cymae* pauciflorae, folia paulo excedentes ; pedicelli 1·5–4 mm. longi, filiformes. *Flores* vix 4 mm. diametro. *Sepala* ovata, obtusa, 0·5 mm. longa. *Petala* ovato-oblonga, alba, roseo-suffusa. *Capsula* 3-loba, depressa, rubra, 2·5–3·5 mm. diametro.

TRANSVAAL. In the bush near Modderfontein, *Conrath*, 88.

925. **Pappea fulva,** *Conrath* ♂ [Sapindaceae] ; affinis *P. capensi*, Eckl. & Zeyh., sed ramis novellis foliisque laxe tomentellis, floribus minoribus, filamentis petala longe superantibus distincta.

Arbuscula 3–4 m. alta,ramis cinereis, novellis fulvo-tomentellis. *Folia* congesta, simplicia, late-oblonga, apice rotundata, interdum subapiculata, basi inaequaliter subtruncata, margine integra vel crenulata vel undulata, ad 6 cm. longa et 2·5 cm. lata, coriacea, subtus fulva, utrinque laxe tomentella, nervis lateralibus utrinque 18–20 cum venarum reticulatione subtus prominentibus ; petiolus 5–10 mm. longus. *Racemi* masculi ad 10·5 cm. longi, 1·2–1·5 cm. lati, graciles, fulvo-pubescentes ; pedicelli 2 mm. longi. *Calyx* 5-fidus, cupularis, pubescens. *Petala* latissime rotundata, 0·5–0·7 mm. longa, basi transverse plicata. *Discus* tomentellus. *Filamenta* 2–2·5 mm. longa. *Antherae* 1 mm. longae. *Ovarii* rudimentum tomentosum.

TRANSVAAL. In bush near Modderfontein, *Conrath*, 295.

[The same plant is represented at Kew by two specimens collected by Rehmann in the Transvaal :—No. 4007, from Aapies Poort near Pretoria (♂) and No. 5460, from Streydpoort in the Makapansbergen (♀). The leaves of Rehmann's No. 4007 are up to 8 cm. long and almost 4 cm. wide with crenulate or acutely serrulate margins. No. 5460 has a foliage exactly like that of Mr. Conrath's plant ; but the stamens are imperfect and almost sessile, whilst the 3-lobed ovary is terminated by a distinct short columnar style. *See* also Mr. J. Burtt-Davy's note on this plant in *Kew. Bull.* 1908, p. 178, under *Pappea capensis.*

G. fulva resembles more *P. ugandensis*, Bak. f., than *P. capensis*, but may be easily distinguished by the long pedicelled (not subsessile) ♂ flowers. It will also have to be compared with *P. Schumanniana*, Schinz, of which there is no specimen at Kew. This is, however, described as having glabrous petals and longer (4 mm.) filaments—Otto Stapf.]

926. **Melolobium subspicatum**, *Conrath* [Leguminosae]; affine *M. Wilmsii*, Harms, sed foliolis obtusis, floribus minoribus, calycis labio infero ad ½ tridentato dentibus angustis distinctum.

Caules lignescentes, ad 35 cm. longi, virgato-ramosi, adpresse pubescentes, deinde glabrati. *Folia* sparsa, parce pubescentia; foliola linearia, ad 20 mm. longa, 1–2 mm. lata, intermedium quam lateralia longius, integra, obtusa; petiolus 5–6 mm. longus. *Racemi* terminales, laxi, ad 10 cm. longi; pedicelli vix ulli, basi bracteati, apice bibracteolati. *Calyx* tubulosus, bilabiatus, 5 mm. longus; labium superum brevius, 2-dentatum, inferum 3-dentatum dentibus elongato-triangularibus obtusiusculis. *Corolla* e calyce breviter exserta; vexillum unguiculatum, exauriculatum, late ellipticum, obtusum, luteum, interdum roseo-suffusum; alae vexillum aequantes, sursum curvatae, oblique ovato-oblongae, tenuiter unguiculatae, obtusae; carinae petala apice cohaerentia, late oblique ovata, rotundato-auriculata, obtusa, quam alae breviora. *Antherae* alternae majores. *Stylus* glaber; stigma capitatum. *Legumen* oblongo-lanceolatum, basin versus attenuatum vel ad medium latissimum, sparse pubescens, 11–14 mm. longum, ad 3 mm. latum.

TRANSVAAL. Irene, *Conrath*, 138.

927. **Lotononis mucronata**, *Conrath* [Leguminosae]; affinis *L. microphyllae*, Harv., foliis longius petiolatis, stipulis majusculis, carina glabra diversa.

Herba basi lignosa, prostrato-adscendens, caulibus ad 35 cm. longis, primo dense adpresse albo-pilosa, deinde glabrata. *Folia* trifoliolata; petiolus foliola aequans vel subbrevior, adpresse albo-pilosus; foliola elliptico-oblonga, acuta, 2–5 mm. longa, primo subtus imprimis ad costam adpresse albo-pilosa, mox glabrata; stipulae solitariae, foliolis similes nisi breviores et angustiores. *Flores* axillares, solitarii; pedicelli albo-pilosi, calyce breviores. *Calyx* turbinato-obconicus, 5–6 mm. longus, parce pilosus, alte inaequaliter 5-fidus, segmentis 4 superioribus per paria altius connatis, omnibus lanceolatis acutis. *Corolla* albida, calyce sesquilongior; vexillum unguiculatum, lamina ovata acuta demum angulo recto patente, in dorso parce pilosula, basi auriculis inflexis instructa; alae oblique oblongae, obtusae, unguiculatae, auriculatae, glabrae, 7 mm. longae; carina recta, alis similis nisi latior, glabra, 8 mm. longa. *Stylus* glaber, incurvatus. *Legumen* oblongum, compressum, in sutura superne et ad styli persistentis basin parce pilosum, caeterum glabrum, 11 mm. longum, 3 mm. latum.

TRANSVAAL.—Modderfontein, *Conrath*, 124.

928. **Lotononis orthorrhiza**, *Conrath* [Leguminosae], affinis *L. tenellae*, E. & Z., sed calycis tubo longiore (4 mm. longus), corolla magis pilosa, legumine calycem aequante praeter suturam glabro.

Herba annua (?), radicibus verticaliter descendentibus ad 5 mm. crassis, caespitosa, caulibus numerosis prostrato-adscendentibus ramosissimis 4–5 cm. longis, fere tota dense patule albo-pilosa. *Folia* trifolioliolata; petiolus gracilis, 4 (raro ad 5) mm. longus; foliola elliptica vel oblongo-lanceolata, acuta, supra glabra, subaequalia, 4–6 mm. longa, 2–2·5 mm. lata; stipulae solitariae, lanceolatae,

foliosae, petiolo duplo breviores. *Flores* axillares, solitarii, breviter pedicellati; bractea linearis. *Calyx* ultra medium 5-fidus, 7 mm. longus, segmentis lanceolatis acute acuminatis, antico angustiore. *Corolla* calycem paulo superans, pilosa, albida; vexillum unguiculatum, lamina e basi subcordata ovata, acutum, 8–9 mm. longum; alae vexillum aequantes, oblongae, obtusae, distincte auriculatae; carina vexillum aequans, oblique ovato-oblonga, obtusa, auriculata, anguste unguiculata. *Ovarium* superne longe-pilosum. *Stylus* longe arcuato-ascendens. *Legumen* calycem aequans, oblique oblongo-ovoideum, subtumidum, praeter suturam pilosam glabrum. *Semina* pluria, funiculo longo.

TRANSVAAL. Modderfontein, *Conrath*, 121.

929. **Lotononis macrosepala**, *Conrath* [Leguminosae]; species distinctissima, quoad sectionem dubia, nisi § *Leptis*, a qua vero distat calycis structura et indumento densissimo argyreo-tomentoso.

Caules plures, e rhizomate repente ascendentes vel erecti, uti tota planta densissime argyreo-tomentosi, 10–15 cm. alti. *Folia* 3-foliolata, internodiis longiora; petiolus 4–10 mm. longus; foliola obovato-oblonga vel oblanceolato-oblonga, subapiculata, ad 3 cm. longa, 0·3–0·8 cm. lata, nervo mediano subtus crassiusculo; stipulae foliaceae, lanceolatae vel elliptico-lanceolatae, acutae, 0·8–1·3 cm. longae. *Flores* solitarii, folio oppositi, brevissime (2 mm.) pedicellati. *Calyx* ultra medium 5-fidus, segmentis subaequalibus lanceolatis acute acuminatis, 11–12 mm. longus, demum paulo auctus. *Corolla* calyce subbrevior, glabra; vexillum ellipticum, acutum, basi in unguem quam lamina dimidio breviorem latiusculum contractum, 10 mm. longum; alae oblique ellipticae, apiculatae, unguiculatae, vix auriculatae, 8 mm. longae; carina oblique elliptico-oblonga, subobtusa, anguste unguiculata, 6 mm. longa. *Ovarium* tomentosum. *Stylus* uncinato-incurvatus. *Legumen* lanceolato-oblongum, ad 2 cm. longum, 0·4–0·5 cm. latum. *Semina* circiter 12, funiculis longis, 1·5 mm. diametro.

TRANSVAAL. Modderfontein, *Conrath*, 133.

930. **Indigofera rostrata**, *Conrath* [Leguminosae]; affinis *I. leptocarpae*, Eckl. & Zeyh., sed foliolis majoribus, racemis longius pedunculatis distincta.

Herba perennis, pluricaulis, caulibus a basi virgato-ramosis sulcatis ut tota planta dense pilis bifurcatis adpressis aspersis. *Folia* pauca, remota, petiolo circiter 3 mm. longo; foliola sublinearia, apiculata, 4–20 mm. longa, 0·5–1 mm. lata, terminale quam lateralia multo longius; stipulae subulatae, 1 mm. longae. *Racemi* pedunculo ad 12 cm. longo suffulti, primo densiflori, deinde elongati, laxi, multiflori; pedicelli circiter 5 mm. longi. *Calyx* oblique turbinatus, 5 mm. longus, alte 5-fidus, segmentis lineari-subulatis, acutis, antico longissimo. *Corolla* 7 mm. longa; vexillum ovatum, acutum, late-unguiculatum; alae vexillo paulo breviores, auriculatae; carina alis brevior, apiculata, exauriculata. *Ovarium* lineare, dense pilosum, pluriovulatum. *Legumen* (immaturum) nutans.

TRANSVAAL. Modderfontein, *Conrath*, 1196.

931. **Rhynchosia remota**, *Conrath* (Leguminosae); affinis *R. pilosae*, Harv., sed indumento copioso, foliorum nervis utrinque 8–9 (haud 5–6), racemis 2–4-floris, floribus 1–0·5 cm. distantibus, pedicellis brevibus distincta.

Caulis 1 m. altus, scandens, teres, dense patule pubescens. *Folia* petiolo ad 3 cm. longo; foliola ovato-oblonga, minute apiculata, terminale basi rotundatum vel subcordatum, lateralia basi magis minusve obliqua, ad 3·5 cm. longa, 1·5 cm. lata, utrinque pilosa et (imprimis subtus) prominule reticulata; petiolulus terminalis 5 mm. longus, laterales 1 mm. longi; stipulae subulatae, 3 mm. longae. *Racemi* axillares, 2–4-flori, 8 cm. longi; pedicelli filiformes, dense pubescentes, 2–3 mm. longi. *Calyx* 7 mm. longus, patule pilosus, tubo lato 2 mm longo, segmentis caudato-subulatis. *Corolla* ignota. *Legumen* oblongum, subincurvum, patule pilosum, 20 mm. longum, 4·5–5 mm. latum.

Transvaal. Witpoortje, near Johannesburg, *Conrath*, 262.

932. **Heteromorpha involucrata**, *Conrath* (Umbelliferae); ab affini *H. arborescente*, Cham. & Schlecht., differt foliis magis dissectis, umbellis diametro majore radiisque numerosioribus, involucro foliaceo.

Herba 50–70 cm. alta, glabra; caulis pallidus, farctus, superne sulcatus, simplex vel superne parce ramosus. *Folia* glauca, inferiora longe petiolata, ad 7·5 cm. longa, ambitu ovata, 3-partita, segmentis lateralibus alte inaequaliter 2-fidis anguste lanceolatis acutis, segmento terminali alte 3-fido (lobo intermedio saepe alte bilobo) longe decurrente, in marginibus et subtus in nervis aspera, crassiuscula, tenuiter reticulata, superiora breviter petiolata vel sessilia, 2 cm. longa, 3-partita, segmentis lateralibus integris, intermedio 3-fido, summa integra. *Umbellae* terminalis radii 25–35, 2·5–4·5 cm. longi, lateralium pauciores, breviores, omnes angulares; involucrum phyllis foliaciis alte 2–3-fidis vel integris ad 1·5 cm. longis 2 mm. latis. *Umbellulae* radii 6–18 inaequilongi, 2–5 mm. longi; involucellum phyllis foliaceis anguste lanceolatis integris 1–3 mm. longis. *Sepala* triangularia, acuta. *Petala* lutea. *Mericarpia* (immatura) ovato-oblonga, stylis divergentibus, stigmate atro-rubro.

Transvaal. Modderfontein, *Conrath*, 328. (The same plant, but with broader leaf-segments, was collected by Dr. Wilms near Pretoria on Rensburg's Farm (no. 563*b*) and near Lydenburg, no. 563.—Otto Stapf.)

933. **Vangueria setosa**, *Conrath* [Rubiaceae]; affinis *V. macrocalyci*, Sond., a qua foliis lanceolatis parce hispidis, pedicellis longioribus, calycis segmentis angustioribus minoribus differt.

Fruticulus parce ramosus, 6–12 cm. altus, ramis demum glabratis teretibus inermibus. *Folia* subsessilia, pauca versus ramorum apices, oblonga, obtusiuscula vel subacuta, 8–7 cm. longa, 1·2–3 cm. lata, utrinque praecipue in nervis setulosa, setis flavescentibus, rarius subglabra; stipulae lineari-subulatae, basi in vaginulam connatae. *Cymae* breviter pedunculatae, pluriflorae, 2–2½ cm. longae; pedicelli setulosi, calyce paulo longiores; bracteae ovato-oblongae, obtusiusculae. *Receptaculum* dense hispidulum vel subglabrum, 1·5–2 mm. longum. *Calyx* alte 5-fidus, segmentis

lineari-lanceolatis 4–5 mm. longis. *Corolla* viridi-lutescens, 10–11 mm. longa, tubo 4–4½ mm. longo, lobis oblongo-triangularibus caudatis extus hispidulis vel glabris intus praeter basin parce barbatam glabris. *Stylus* antheras aequans ; stigma breviter cylindricum, medio paulo constrictum, sulcatum. *Fructus* depresso-pyriformis, parce puberulus vel glaber, 15–17 mm. diametro.

TRANSVAAL. Modderfontein, *Conrath*, 339. An almost glabrous state occurs along with the typical form.

[This species is also represented at Kew by a specimen collected by Burtt Davy (No. 1475) near Krekemoor Station, Transvaal and another gathered by Holub in the Batlapin Territory, Bechuana Country.—Otto Stapf.]

934. **Helichrysum polyphyllum**, *Conrath* [Compositae] ; affinis *H. cephaloideo* (imprimis var. *polycephalo*), sed foliis brevioribus, capitulis minoribus, involucri bracteis obtusis extus longe pubescentibus differt.

Herba annua, e basi pluricaulis, 20–30 cm. alta ; caules breviter ascendentes, erecti, simplices, usque ad capitulorum glomerulum terminalem dense foliati et uti folia adpresse sericeo-lanati. *Folia* basalia congesta, oblongo-elliptica, lanceolata, 12 mm. longa, 5–6 mm. lata ; caulina quam internodia longiora, oblongo-lanceolata e basi lata semiamplexicauli, subacuta, 10–18 mm. longa, 1·5–2·5 mm. lata, inferiora oblique erecta, superiora adpressa apicibus saepe patulis glabris membranaceis. *Capitulorum* glomerulus circa 10 mm. diametro ; capitula obovoidea, 5–6 mm. longa, phyllis 5-seriatis glabris infimis albo-luteis late oblongo-ovatis obtusis superioribus luteis vel subfuscatis oblongis magis minusve acutis. *Flores* circiter 15, lutei, in receptaculo fimbriato. *Pappi* setae circiter 15, corolla paulo breviores, inferne breviter, superne longius plumosae.

TRANSVAAL. Modderfontein, *Conrath*, 444.

935. **Wahlenbergia subnuda**, *Conrath* [Campanulaceae] ; affinis *W. virgatae*, Engl., sed floribus multo minoribus.

Herba perennis, pluricaulis, ad 25 cm. alta, tota glabra ; caules infra medium et supra iterum furcati, erecti, obtuse angulati, ramis virgatis unifloris. *Folia* remota, squamiformia, triangularia vel lanceolata, integra, 2–3 mm. longa, 1 mm. lata. *Flores* erecti, pedicellis 3–5 cm. longis suffulti. *Receptaculum* elongato-obconicum, 3–3·5 mm. longum. *Sepala* triangularia, obtusiuscula, integra, 2–2·5 mm. longa. *Corolla* late infundibuliformis, ultra medium 5-fida, 5–6 mm. longa. *Antherae* corollae sinus paulo superantes. *Stylus* superne incrassatus et parce puberulus, ad stigmatum bases utrinque glandula notatus, e corolla breviter exsertus. *Capsula* elongato-obconica, 2 locularis.

TRANSVAAL. Modderfontein, *Conrath*, 557.

936. **Manulea limonioides**, *Conrath* ; [Scrophulariaceae], a *M. obovata* differt caulibus glabris glaucis, foliis praeter nonnulla caulina parva late linearia in rosulam congestis, corollae lobis brevioribus latioribus,

Herba perennis e collo crasso. Caules stricti, ad 70 cm. alti, praeter basin pruinosam glabri, glauci. *Folia* basalia, rosulata, oblongo-spatulata in petiolum attenuata, apice integra vel emarginata, 3–6 cm. longa, 0·25–1·2 cm. lata ; caulina pauca, remota, late linearia, 0·6-1 cm. longa. *Flores* in cicinnos geminatos 5–10-floros 1–2 cm. distantes 0·5–1 longos secundum rhachin communem ad 40 cm. longam dispositi, subsessiles, 4–5 cm. longi ; bracteae lineares, calyce breviores. *Calyx* alte divisus, vix 2 mm. longus, segmentis linearibus vel lineari-oblongis obtusis minute parce glanduloso-asperulis. *Corollae* tubus tenuis, 3–5 mm. longus, glaber vel subglaber ; lobi patuli, inaequilongi, oblongi vel ovati, obtusi, ad 1 mm. longi. *Stamina* inclusa. *Capsula* oblonga, apiculata, glabra, 2·5–3 mm. longa, 1·5 mm. lata.

TRANSVAAL. Rietfontein near Johannesburg, *Conrath*, 979.

937. **Loranthus glabriflorus**, *Conrath* [Loranthaceae] ; ab affini *L. prunifolio*, E. Mey., foliis breviter petiolatis, perianthiis glaberrimis distat.

Fruticulus glaberrimus, in *Acacia sp.* parasiticus, ramis fuscis. *Folia* alterna vel opposita, breviter petiolata, oblongo-elliptica, vel oblongo-lanceolata, obtusiuscula, 2·5–3·5 cm. longa, 0·5–1·2 cm. lata, crassiuscula, nervis utrinque prominulis, haud glauca. *Flores* pauci fasciculati, brevissime pedicellati ; bracteae breviter cupuliformes. *Calyx* glaber, quam pedicellus longior ; dentes distincti, rotundati, tubum aequantes. *Perianthium* tubulosum, basi constrictum, medio crassitudine ovarii, rubrum, 4–4·2 cm. longum, ad medium fissum, lobis 5 spatulatis 1·3–1·4 cm. longis canaliculatis. *Antherae* 3·5 mm. longae. *Stylus* corollam paulo superans, sub apice tenui 3 mm. longo ad 6 mm. incrassatus ; stigma rotundato-pyramidatum.

TRANSVAAL. Near Witpoortje, *Conrath*, 331.

938. **Ischaemum Franksae**, *Wood* [Gramineae] ; species distinctissima, nulli arcte affinis, foliis angustissimis, spiculis parium singulorum fere aequalibus, glumis inferioribus exalatis dorso planis ad carinas et in nervis intracarinalibus tuberculatis.

Gramen compacte caespitosum, innovationibus intravaginalibus et culmis floriferis arcte congestis basi vaginis vetustis induratis post ignes persistentibus vestitis. *Culmi* graciles, ad 20 cm. alti, 1–3-nodi, glabri praeter internodium summum sub inflorescentiam albo-vel griseo-pilosum. *Foliorum* vaginae basales lateraliter compressae, carinatae, durae, pilosae, demum glabrescentes, diu persistentes, culmorum laxiusculae, superne angustatae, purpurascentes, pubescentes, praeter summum quam internodia longiores ; ligulae ad lineam pilosam reductae ; laminae setaceo-filiformes, acutae, lateraliter compressae, sectione tranversa semi-oblonga, facie planae vel culmorum subcanaliculatae, innovationum 20 (vel ultra) cm. longae, 0·5–0·75 mm. latae (*i.e.* a latere), laete virides, laeves, glabrae nisi prope basin pilosae. *Racemi* purpurascentes, 2–3, erecti, 2·5–5 cm. longi, breviter pedunculati, pedunculis cinereo-pilosis, pedunculo communi basi barbato et interdum bractea ad 1·5 cm. longa subulata suffulto ; articuli clavato-triquetri, extus albo-pilosi, 4–6 mm. longi. *Spiculae sessiles* oblongo-lanceolatae, acutae, 6–8 mm. longae ; gluma inferior basi albo-barbata,

chartacea, dorso applanata, in carinis et nervis intracarinalibus plerisque tuberculato-aspera, tuberculis carinalibus pilos albos rigidos breves 1 vel 2 gerentibus, nervis a facie visis viridibus carinalibus inclusis 8–9; gluma superior navicularis, inferiorem aequans, membranacea, 5-nervis, carinata carina rigide-ciliata, marginibus ciliolatis; anthoecium inferum ♂, valva oblongo-lanceolata 5–6 mm. longa hyalina purpurascente 3-nervi dorso minute asperula ciliolata, palea 2-nervi hyalina valvam subaequante; anthoecium superum ♀, valva apice minute 3-dentata dente intermedio mucronulato, caeterum anthoecio inferiori simile. Antherae 4 mm. longae. *Spiculae pedicellatae* pedicello clavato extus piloso ad 6 mm. longo suffultae, sessilibus similes nisi nervi glumae inferioris intracarinales tantum 3 et valva anthoecii superioris masculi vel hermaphroditi vix tridentata.

Natal. Tabanhlope, 1800–2400 m., *J. Wylie* (Hb. Wood 10540). This grass has been named after Miss Franks, Assistant in the Government Herbarium, who dissected it and has made all the drawings and dissections in vol. V. of 'Natal Plants,' which volume includes grasses only.

(Mr. Wood's description has been amplified from the excellent material which he was good enough to communicate to Kew. Technically this striking species would come under the section *Eu-ischaemum*, but I have not been able to make out its exact affinities.—Otto Stapf.)

939. **Agrostis suavis**, *Stapf* (Gramineae); arcte affinis *A. erianthae*, Hack., sed panicula divaricato-effusa a folio summo remota, ramis 4–5-natis semiverticillatis.

Gramen perenne, laxe caespitosum, innovationibus mixtis, extravaginalibus e basi breviter repente ascendentibus vel in stolones abeuntibus. *Culmi* erecti, ad paniculae basin circiter 50 cm. alti, 3-nodi, glabri, simplices, internodiis exsertis, summo sub anthesi ultra vaginae os 8-12 cm. producto. *Foliorum* vaginae laxiusculae, imprimis superiores, glabrae, laeves, infimae purpurascentes; ligulae hyalinae, oblongae, ad 5 mm. longae; laminae anguste lineares, breviter acutae, exsiccando plicatae, ad 15 cm. longae (summae 3·5–4·5 cm. longae), explicatae ad 2 mm. latae, laete virides, glabrae, apicem versus scaberulae, facie inter nervos primarios utrinque circiter 4 fere ad medium angustissime sulcatae. *Panicula* divaricata, laxa, ambitu obovata vel oblonga, ultra 20 cm. longa, ad 15 cm. lata; rami inferiores semiverticillati, 4–5-ti, superiores 2-ti, plerique ad 2·5–3·5 cm. (nonnulli ad 6 cm.) indivisi, abhinc bis vel ter vel quater geminatim ramulosi, longiores toti 12 cm. longi, filiformes; inferne laeves, superne asperuli; pedicelli capillares, terminales ad 18 mm. longi, laterales 3-10 mm. longi. *Spiculae* 4–4·5 mm. longae, stramineae, saepe purpureo-suffusae; rhachilla ad pilorum fasciculum vix 1 mm. longum redacta. *Glumae* aequales, lanceolatae, acutae, 1-nerves, scariosae. *Valva* a latere visa anguste lanceolata, explanata ovato-lanceolata, 3·5 mm. longa, breviter bifida, 5-nervis, nervis lateralibus in mucronulos excurrentibus, dorso laxe tenuissime pilosa, paulo infra medium aristam setiformem 5-6 mm. longam edens. *Palea* hyalina, 2-nervis, truncata quam valva paulo brevior, glabra.

Antherae non visae. *Caryopsis* lineari-oblonga, circa 1·3 mm. longa, 0·4 mm. lata.

NATAL. *Van Reenen*, 1500–1800 m., *Wood*, 8913.

This differs from *A. eriantha*, Hack., a native of the Transvaal, solely in the habitus of the panicle. Mature specimens of *A. eriantha*, communicated by Messrs. Sutton, have the same narrow contracted panicles as Schlechter's younger flowering type samples of that species and the branches of their panicles are throughout geminate. On the other hand, all of Wood's specimens at Kew (4 sheets) exhibit the habitus described above.

XXX.—MISCELLANEOUS NOTES.

Grey Squirrels—Kew is indebted to His Grace the Duke of Bedford for two pairs of American grey squirrels, which have been placed in the grounds of Queen's Cottage.

Portrait of Dr. James Macfadyen.—The presentation to the Royal Gardens, by Mr. John James Macfadyen, of a portrait in oils of his father, the late Dr. James Macfadyen, forms an interesting addition to the unique collection of portraits of Botanists contained in the Museum No. I. The portrait has been hung near the ascent staircase of the middle floor of the museum. The following Memoir of Dr. Macfadyen, who was a correspondent of the late Sir William Hooker, appeared in the *Proceedings of the Linnean Society of London*, 1851, Vol. 2, p. 135 :—

"James Macfadyen, M.D., was a native of Glasgow, in which city his father was an eminent music-seller. He himself while a student of the University there, destined for the medical profession, distinguished himself by his great love of natural history, more especially in the botanical class, and took his degree of M.D. about the year 1821 or 1822. He was on the point of practising as a physician in his native city, when the late Mr. George Hibbert wrote to request Sir William Hooker to recommend a well-educated botanist, competent to take charge of a garden which the local government in Jamaica contemplated forming at Bath (in that island). Dr. Macfadyen was immediately appointed on Sir William Hooker's recommendation, and established the garden, which unfortunately, owing to the very depressed condition of the colony, was too ill supported to justify his continuing long to superintend it. He consequently gave up the garden and established himself in medical practice, which proved very lucrative. After some years he embarked his savings in the purchase of land and retired from practice. This kind of property, however becoming greatly reduced in value, and having a family to provide for, he was again obliged, scarcely two years ago, to have recourse to his profession for a livelihood. He was most active among all classes of people during the prevalence of the cholera, which has lately so devastated that island, and in the course of his professional labours he took the disorder himself and fell a victim

to it. His kind and benevolent disposition endeared him to a large circle of friends, and his hospitality to strangers, especially naturalists visiting Jamaica, was almost proverbial.

"In 1837 he printed, at Glasgow, and at his own expense, the first volume of his 'Flora of Jamaica,' which extended as far as the end of Leguminosae, following De Candolle's arrangement.

"It described in popular language the then known species of the island, and treated largely on the uses and properties of the native plants. Its limited sale and the arduous duties of his profession retarded the continuation till last year. A great portion of the second volume was actually printed in Jamaica, including a very considerable number of new species, when the further progress of the work was arrested by his sudden decease. He was elected a Fellow of the Linnean Society in the year 1838, and the intelligence of his being chosen a Fellow of the Geological was sent out only a few days before his decease. Besides the 'Flora of Jamaica,' Dr. Macfayden wrote and published in the island an account of the Nelumbium Jamaicense of Patrick Browne, and of the particulars of its rediscovery, nearly a century after Browne had noticed it; and he also published several memoirs relating to the commercial and agricultural welfare of Jamaica."

It will be observed that there is a discrepancy between the foregoing account in reference to the Bath Botanic Garden and that given by Sir Daniel Morris in his account of the "Botanical Institutions of Jamaica," Jamaica Handbook for 1901, pp. 395–400, reprinted in the Kew Bulletin No. 3, 1906, p. 61. According to Sir D. Morris the Bath Garden was established in 1779, and appears to have flourished until 1810. From this time onwards, owing to the "influence of domestic trouble, want of due appreciation of the value and nature of Botanic Gardens, or the need of strict economy," the garden fell upon evil days, but was, however, maintained in a very reduced state until 1824, when a Committee was formed to inquire into the state of the Botanic Gardens, and as a result of its deliberations it was decided to engage a botanist to work up the vegetable economic resources of the island, and the appointment was made of Dr. Macfayden, who arrived in the island in 1825.

At the same time it was felt that the Botanic Garden at Bath was too distant from Kingston and the seat of Government to answer the intention proposed, and it was recommended that a Bill be brought in for the purchase of a proper place for a garden in the vicinity of Kingston and Spanish Town. This appears to have been the garden that Dr. Macfayden was to have formed; the proposal, however, was not carried into execution.

Dr. Macfayden was born in Glasgow in 1800, and died at Jamaica in 1850.

Presentations to Museums.—An interesting old plan of the Botanic Gardens, Kew, from the Rev. F. J. Dickinson, Wentworth Rectory, Isle of Ely.

Specimens of *Odontopus sexpunctulatus*, an insect which pollinates *Welwitschia mirabilis*. From Prof. H. H. W. Pearson, M.A., F.L.S., South African College, Cape Town.

Portrait of Lord de Tabley as a young man. Presented by the Hon. Lady Leighton Warren, Tabley House, Knutsford.

Stem of a giant sunflower, and specimens of deformed roots of a pear tree grown at Kew. From Mr. Pitt, Kew Green.

Samples of Raphia wax and fibre from Madagascar. From the Editor, British Trade Journal.

1. *Polystictus sanguineus*. 2. Stems of *Lapageria rosea* twisted into rings; also used for basket-making. Temuco, Chili, from Mr. R. M. Middleton, F.L.S., Kew.

West African Mahogany. Eight small samples, from Mr. James A. Weale, Bootle, Liverpool.

Bamboo joint from a correspondent in Japan showing the manner in which the Japanese use the Bamboo as a natural mailing-case. Presented by Mr. C. G. Lloyd, Cincinnati, Ohio, U.S.A.

Rough and finished hay forks of the wood of "Micocoulier" (*Celtis australis*), from the Riviera. The tree is cultivated for the purpose of making forks in this part of France, being pollarded and trained to the shape required. The wood is also much used for whip-handles and the fruit is eaten by the country people. These specimens were presented by Mr. Kyllmann of Antibes at the suggestion of Mr. J. F. Duthie, F.L.S.

J. M. H.

Triumfetta cordifolia.—Numerous African specimens of fibre-yielding species of *Triumfetta* having been received recently for identification, it became necessary to re-examine the African material which had been referred to *T. cordifolia* and *T. semitriloba*, and the results are now given.

T. cordifolia was described in 1831 by A. Richard in Guillemin and Perrottet's *Flora of Senegambia*, p. 91, t. 18, from specimens collected in "palm woods" at Cape Verde. With the exception of a brief note in Hooker's Niger Flora, p. 236, there is no further reference to *T. cordifolia* until 1868, when it was reduced by Masters (*Fl. Trop. Afr.*, vol i., p. 257) to *T. semitriloba*, Jacq., which differs from *T. cordifolia*, however, in the *retrorsely pilose* prickles of the capsule (*see DC. Prodr.*, vol. i., p. 507; *Mart. Fl. Bras.*, vol xii., part iii., p. 135), a character of great importance in the genus *Triumfetta*. Masters's reduction was accepted by nearly all subsequent writers, including Hiern (*Cat. Afr. Pl. Welw.*, vol. i., p. 97), Schumann (*Engl. Pfl. Ost-Afr.*, vol C, p. 264), and De Wildeman (*Ann. Mus. Congo*, sér. 5, vol. i., p. 56); Schumann, however, separated the African material of *T. semitriloba* as a new variety *africana*, based on differences of foliage and inflorescence, and suggested that it might perhaps be better to treat it as a distinct species.

Williams adopted the name *T. cordifolia* in his *Florula Gambica* (*Bull. Herb. Boiss.*, sér. 2, vol. vii., 1907, p. 201), on the authority of a "note by Planchon in Herb. Kew, as to its being quite distinct from *T. semitriloba*," and without mentioning any distinguishing characters. This note, however, has not been found, although two sheets in the Kew Herbarium (Gambia, *Capt. Boteler;* Sierra Leone, *Mann*, 869) are named *T. cordifolia* by Planchon, who points out that the stamens of Capt. Boteler's plant are 10 in number as in the plate of *T. cordifolia*, instead of 25 as in the description. Further discrepancies between text and plate are that the petals are described as being slightly longer than the sepals and the capsule as glabrous, whereas the petals are figured as considerably shorter than the sepals and the fruit as hirsute. The Kew material agrees with the plate as regards the petals and stamens, whilst the fruits are hairy on some specimens and glabrous on others. In what follows, *T. cordifolia* means the species figured in the *Flora of Senegambia*, not the one described. It seems probable that the material examined by Richard consisted of a mixture of two distinct species.

T. cordifolia as defined above, appears to be a polymorphic species, exhibiting considerable variation in the indumentum of the stem, leaves, flower and fruit, and in the lobing and serration of the leaves; and both pentamerous and hexamerous flowers may be found on the same inflorescence. Three well-marked varieties may be distinguished, however, which, but for the existence of a few intermediates, might almost be regarded as distinct species. Typical *T. cordifolia* is characterized by unlobed leaves and by a sparse indumentum consisting mainly of small stellate hairs; variety *Hollandii* by unlobed or three-lobed leaves, and by the presence on stem, leaves and flower-buds of numerous, long, simple hairs in addition to small stellate ones; and variety *tomentosa* by three-lobed or almost five-lobed leaves, clothed with a fine dense stellate tomentum. The type occurs from Senegambia to the Cameroons; var. *Hollandii* from the Gold Coast to Nigeria and Fernando Po; and var. *tomentosa* in the Cameroons and Angola. This distribution would seem to indicate that var. *Hollandii* and var. *tomentosa* are geographical races, but further material is required, from different localities, and representing all stages in the development of the plant, before the point can be decided. The following conspectus of the varieties and forms is to be regarded, therefore, as provisional :—

TRIUMFETTA CORDIFOLIA, Guill. et Perr. Fl. Seneg., t. 18 (1831), *sensu amplif.*, non descr. *T. semitriloba*, Mast. in Fl. Trop. Afr., vol. i., p. 256, non Jacq. *T. semitriloba*, var. *africana*, K. Schum. in Engl. Pfl. Ost-Afr., vol. C., p. 264.

Var. *a.* TYPICA, Sprague, foliis indivisis, indumento sparso e pilis parvis stellatis plerumque constante.—*T. cordifolia*, Guill. et Perr. *l.c.*, *sensu restrict.*; F. N. Williams in Bull. Herb. Boiss., sér. 2, vol. vii., p. 201; Stapf in Johnston, Liberia, vol. ii., p. 583. *T. angulata*, Hook. f. in Niger Fl., p. 235.

Forma 1. PILOSA, Sprague, aculeis capsulae pilosis. Senegambia, *Heudelot*, 629. Gambia, *Ingram*, *Boteler*. Sierra

Leone, *Dudgeon*, 5½, 6b, 7a, 7b. Bagru River, *Mann*, 869; very common on open places near Sierra Leone, *Scott Elliot*, 4163; in woods on the way to Lester Peak, *Scott Elliot*, 3899. Liberia, within six miles of Monrovia, *Whyte*. Lagos, *Rowland*. Cameroons, *Preuss*, 1356 (distributed as *T. semitriloba*, var. *kamerunensis*, K. Schum.).

Forma 2. LEIACANTHA, Sprague, aculeis capsulae glabris. Sierra Leone, *Taylor* (*Cole*), E.

Variety *typica* (both forms) is used as a fibre plant in Sierra Leone under the name 'Raka' (Racca).

Var. β. HOLLANDII, Sprague, foliis indivisis vel trilobis, ut caulibus et alabastris non solum minute stellato-pilosis sed etiam pilis longis simplicibus ± hirsutis.

Forma 1. INDIVISA, Sprague, foliis indivisis. Lagos, *Barter*, 20.86; Epe, Millen, 5. S. Nigeria, Okimi, *Holland*, 170; Oloke Meji, *Foster*, 363. Gold Coast, near Axim, *Cort Development Syndicate*.

Forma 2. SUBTRILOBA, Sprague, foliis subtrilobis pilis simplicibus interdum minus obviis. Gold Cost, near Axim, *Cort Development Syndicate*. Fernando Po, *Barter*.

Variety *Hollandii* is used as a fibre plant in Lagos under the name 'Esura.' It resembles *T. pilosa*, Roth, in habit, but may be distinguished by the less leafy inflorescence, the indumentum and less obvious mucros of the flower buds and the fewer and shorter prickles of the capsule.

Var. γ. TOMENTOSA, Sprague, foliis trilobis vel subquinquelobis, indumento denso e pilis minutis stellatis constante.—*T. semitriloba*, Hiern, Cat. Afr. Pl. Welw., vol i., p. 97, non Jacq.

Cameroons, Yaunde, *Zenker & Staudt*, 63; *Zenker*, 676; Bipinde, *Zenker*, 1195 (distributed as *T. semitriloba*, var. *africana*, K. Schum.). Angola, district of Golungo Alto, very common in dampish thickets, at the banks of the river Cuango, *Welwitsch*, 1428; cultivated specimen raised at Kew from seed collected by *Monteiro*.

The following specimens seem referable to var. *tomentosa*, though their indumentum is looser and coarser:—Angola, Golungo Alto, frequent in the primitive woods of Sob. de Mussengue, *Welwitsch*, 1427; without precise locality, *Welwitsch*, 4648.

Variety *tomentosa* is known in Angola under the native name 'Quibosa,' and ropes, sacks, &c., are made from the fibre of its stem.

Triumfetta semitriloba, Henriques, in Bull. Soc. Broter., vol. xvi., 1899, p. 58, described as a shrub found in valleys and inundated ground between the rivers Luachimo and Quihumbo, Angola, and known by the native name 'M'pum' (*Marques*, 327) is probably referable to *T. cordifolia*, var. *tomentosa*. *T. semitriloba*, Henriques, *l.c.*, x., 1892, p. 104 (St. Thomas, *Moller*), is *T. rhomboidea*, Jacq.

There remain a few specimens which are intermediate in character. *Irving*, 76, from Abeokuta, Lagos, has flower-buds hirsute with simple hairs, like var. *Hollandii*, but the indumentum of stem and leaves is that of var. *typica* ; and *Johnson*, 476, from the Aburi Hills, Gold Coast Colony, is intermediate between var. *Hollandii* and var. *tomentosa* ; as is also *Bates*, 79, from Batanga, Cameroons.

The question naturally arises whether some at least of the intermediate forms may not be the result of hybridisation, but this can only be solved by the study of the living plants in their natural habitat, accompanied by the preparation of a complete series of specimens illustrating all stages of development.—T. A. S.

Botanical Magazine for May.—The plants figured are *Tillandsia Blokii*, Hort., × *Philadelphus purpureo-maculatus*, Lemoine, *Puya violacea*, Mez, *Liparis tabularis*, Rolfe and *Prunus tomentosa*, Thunb. The material from which the *Tillandsia* was figured was supplied by Mr. F. W. Moore, of the Royal Botanic Garden, Glasnevin. The species is South American, but its exact country of origin is not recorded and altogether very little is known of its history. It is a tall-growing shrub, reaching a height of 6 feet, and flowers only once during its life which may cover a period of 20 years. The *Philadelphus* is a garden hybrid raised by Messrs. Lemoine of Nancy from seeds of *P. Lemoinei*, a hybrid of which *P. boulteri*, S. Wats. is one of the parents. The rather large flowers have white petals with a bright purple-red base, a colour which is absent in all the other hardy species or hybrids in cultivation. A plant from which the drawing was prepared was purchased from Messrs. James Veitch & Sons in 1905. The handsome *Puya violacea* is a Chilian species which has been in cultivation in Europe since 1833. Its bright, deep violet flowers are rarely produced, and it was not till the year 1847 that they appeared on a cultivated plant. That now figured was presented to Kew by the late Mr. J. Anderson Henry, of Edinburgh, in 1879. It flowered in the Mexican House in June last year. *Liparis tabularis* is a somewhat ornamental Orchid with large sheathing leaves and large reddish purple flowers, and is a native of Penang. It flowered in April, 1906, in the collection of Mr. H. T. Pitt, of Stamford Hill, by whom a plant was presented to Kew. *Prunus tomentosa* is a dwarf-growing species native of the mountains of Northern and Western China and, according to Bretschneider, cultivated at Peking for its edible, cherry-like fruits. It has long been in cultivation at Kew, but only occasionally ripens a few fruits. It is, however, a very attractive early-flowering shrub.

'Biak'; an Opium Substitute.—In the *Kew Bulletin*, 1907, p. 199, there is a short note on "Anti-opium plants." Under this heading *Mitragyne speciosa*, Korth., is referred to, as well as *Combretum sundaicum*, Miq. The *Mitragyne*, however, is used not as a remedy but as a substitute for opium (Ridley, 'Malay

Plant Names,' in *Journ. R. As. Soc., Straits Branch*, 1897, p. 58' "Biak (Perak), *Mitragyne speciosa*, Korth. (Rubiaceae). Leaves used as a substitute for opium in Perak, according to Mr. Wray."). Attention was drawn to *Mitragyne speciosa* by Hooper in a communication to the *Pharmaceutical Journal*, vol. 78, 1907, p. 453, where it is inadvertently stated that the leaves of this plant are used as a remedy for the opium habit, and in consequence *Mitragyne* was included as an 'anti-opium' plant.

In the *Journal of the Federated Malay States Museums*, vol. II., No. 2, Dec. 1907, Mr. Wray calls attention to the mistake, and gives an account of 'Biak' (*Mitragyne speciosa*). The leaves of this indigenous tree are sometimes used in Malaya as an opium substitute. In Perak its use appears to have declined recently owing to the introduction of cheap opium, but in Patani and other northern States it is reported to be much in vogue.

The tree is known as 'Poko Biak' in Perak and as 'Keton' in Patani. Its geographical range embraces the whole Malayan archipelago and peninsula, and it is widely distributed in Perak. It occurs in the jungle and is planted in the kampongs, and is frequently seen in and around villages.

According to Mr. Wray the drug is prepared for use in one of two ways. "In the first the leaves are picked and put out to dry in the sun until they become crisp, when they are reduced to powder by rubbing between the hands, the fibrous ribs and veins of the leaves being removed during the process. The resulting powder may then be stored for future use . . .

"The dose would be 136 grains, or, say, $2\frac{1}{4}$ drams apothecary's weight. The powder is mixed with cold water in a cup and the whole drunk, or an infusion is made with hot water and it is taken like tea. It is usual to take it twice a day, before meals.

"The second method of preparation is to dry the leaves as before in the sun, then boil them in water so as to form an infusion. This is strained and the clear filtrate is evaporated to a sirupy consistency. This extract can be kept a long time, and is usually stored in the little horn boxes used by opium smokers for keeping prepared opium in. It is called *chandu* by the Malays, which is also the name of opium when prepared for smoking. This extract of *biak* is mixed with hot water before taking. The dose is said to be one *hun*, which is equal to 5·83 grains troy. Some people just put it on the tongue and wash it down with a drink of water.

"The extract may also be smoked, somewhat in the same way as prepared opium. The pipe employed for this purpose is made of the bamboo known to the Malays as *buloh minyak* (*Oxytenanthera sinuata*), and is $14\frac{1}{2}$ inches long and $\frac{7}{8}$ inch in diameter. It is closed by a natural septum at one end and is open at the other; this is the end which is applied to the mouth in use. Near the closed end a brass tube is inserted, which projects at right angles to the bamboo and is $1\frac{3}{8}$ inches long, with a bore of $\frac{1}{4}$ inch in diameter. There is in the Museum collection an opium pipe of Patani pattern, almost exactly similar to the one described above, only the bowl, if it may be so called, is of tin in place of brass.

The extract is prepared for smoking by mixing it intimately with the finely shredded leaves of the *Palas* palm (*Licuala paludosa*), cut in the same way, and with the same implements, as native-grown tobacco. This mixture, which is a sticky, fibrous, brown mass, is called *madat*.

"A lamp on a tall foot completes the outfit. A specimen in the Perak Museum has a wooden base in the form of a conventionalized four-lobed flower, of 5½ inches square and 1½ inches thick. The upper part consists of a piece of bamboo 2⅝ inches in diameter, cut so that the upper portion forms a shallow cup, closed beneath by a septum. Below this the greater part of the walls of the bamboo have been cut away, leaving only four equidistant cylindrical-shaped pieces, the lower ends of which are mortised into the wooden base, the whole being 9 inches in height. The cup serves to hold the oil container, which is a valve of a fluvio-marine shell. The wick is of twisted cotton cloth, kept in place by a metal support. Coconut oil is burned in it.

"The method of smoking is as follows : The smoker sits tailor-wise on the floor, with the lamp in front of him. He then takes a small piece of the *madat*, rolls it with his fingers into a pellet the size of the bore of the brass tube, into which he inserts it, then putting his mouth to the other end of the bamboo he brings the *madat* in contact with the flame of the lamp and inhales the smoke of the burning pellet through the pipe. From twenty to thirty pellets are smoked at a time.

"The effects of the drug, whether taken internally or smoked, are said to resemble those of opium, and in large doses it is poisonous, producing stupor. It is also said that users of it suffer from permanent enlargement of the abdomen. This is attributed, by some, to the indolent life which is induced by indulgence in the *biak* habit."

Up to the present time no poisonous alkaloid has been found in the plant, but the matter is still under investigation.

The Malayan Anti-Opium Plant (*Combretum sundaicum*, Miq.).—In the *Kew Bulletin*, 1907, p. 198, reference was made to the discovery of a plant in Malaya, which was reputed to be valuable for the purpose of destroying the desire for opium. The plant has been identified by Mr. Carruthers as *Combretum sundaicum*, Miq., a native of the Malayan peninsula and archipelago. The history of the discovery of the value of the plant is given by Mr. Wray in the *Journal of the Federated Malay States Museums*, vol. II., No. I., December, 1906, and is as follows :—

"A party of Chinese wood-cutters working in the jungle near Seremban in Negri Sembilan, ran out of tea, and to supply its place took the leaves of a jungle climber, dried them and made an infusion in the ordinary way. This, however, was not successful, as the beverage made the men ill with 'sakit pĕrut' (*i.e.*, bowel complaint). The leaves were then roasted and a fair substitute for tea was obtained, which had no ill effects. Then, for some obscure reason, 'tengo,' opium dross, or the refuse opium after being smoked, was mixed with it, and the men continued drinking

the mixture for a week or more in place of tea. After this time it was found that all desire for opium smoking had been lost. Friends of the men were told of the discovery, and so the news was spread and others were induced to try the remedy."

With regard to the further history of the plant and the spread of the knowledge of its properties, Mr. J. G. Alexander has been kind enough to furnish us with the following particulars :—

The young men of the Chinese Y.M.C.A., connected with the church of the Rev. W. E. Horley, of the Methodist Episcopal Church, Kuala Lumpur, heard that in the village of Jelebu in the neighbouring State of Negri Sembilan, a cure for the opium habit had been found, namely, a decoction of the leaves of a forest creeper (*Combretum sundaicum*) which grows abundantly in the tropical jungle. They brought the matter before Mr. Horley as they purposed to devote their leisure to the distribution of the medicine if he would afford them the necessary help. He obtained help from the Anti-Opium Society of Selangor, who undertook to pay all expenses on condition that the medicine was distributed without charge.

In a few weeks the news of the cure spread quickly and after some four weeks, 500 applicants daily were supplied.

An applicant brought with him two bottles, old brandy or whisky bottles which were filled with the decoction and into one of the two he placed—if beginning the cure—his usual quantity of opium dross; this is not repeated, and he fills up the bottle containing it from the other bottle which contains none so that gradually the proportion of opium is reduced to nil. If he came a second time no opium was used.

The somewhat crude method of preparation of the drug is given in detail by Mr. Wray in the article to which reference has already been made. With regard to its chemical nature nothing has as yet been discovered either in the leaves or stem of the plant or in the decoction of the roasted drug which would account for its physiological value.

Medical men seem to be strongly inclined to the view that the plant has no real value and that it is the effect on the mind of the opium consumer which helps him to overcome the opium habit.

In favour of this latter view it appears that in Malaya many of those who were or appeared to be cured have relapsed into the habit, though on the other hand many are still holding their ground after more than a year.

In the *Agricultural Bulletin of the Straits*, vol. vi., p. 46, Mr. Ridley states that at least three kinds of plants were included in the samples of the anti-opium plant received by him from different people, one of them being the *Combretum*, so that until more definite evidence of the value of the anti-opium plant is forthcoming it seems advisable to preserve an open mind on the subject.

1. Tussock Grass—*Poa litorosa*.

To face page 237.

32551